

ECDC *Vibrio* Map Viewer: Tracking the Whereabouts of Pathogenic Species

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Vibrio bacteria are found in marine and estuarine waters around the globe.¹ Several *Vibrio* species cause disease in humans.¹ The bacteria thrive in low-salinity waters, and growth booms when sea surface temperature (SST) exceeds 18°C (64°F).² A team at the European Centre for Disease Prevention and Control (ECDC) has developed a tool, the ECDC *Vibrio* Map Viewer, that uses real-time remotely sensed data on SST and sea surface salinity to predict the occurrence of environmental conditions that favor *Vibrio* proliferation. In a new study in *Environmental Health Perspectives*, the researchers demonstrate that the ECDC *Vibrio* Map Viewer accurately predicted habitat conditions in the coastal Baltic Sea that led to an outbreak of *Vibrio* infections in Sweden in the summer of 2014.³

The most infamous member of the *Vibrio* family is toxigenic *V. cholerae*, the cause of pandemic cholera; infections with other pathogenic vibrios are relatively rare but can be life-threatening. The number of such *Vibrio* infections has risen in tandem with increasing SSTs in temperate and cold regions, including coastal Chile, Peru, the Baltic and North Seas, and the North Atlantic.^{4,5} *Vibrio*-caused illnesses (known collectively as vibriosis) include gastroenteritis, wound infections, and septicemia.⁶ Patients who are immunocompromised or who have underlying conditions such as diabetes, HIV, or liver disease are more likely to suffer potentially fatal systemic infections.⁶

In July and August of 2014, SSTs on the Baltic coast of Sweden reached unprecedented highs, and the ECDC *Vibrio* Map Viewer

lit up with warnings of increased abundance of *Vibrio* species. At the same time, a record number of *Vibrio* infections were reported in Sweden and Finland, more than double the number of cases recorded in recent years.⁷ These cases included the most northerly examples of vibriosis yet recorded, some within 100 miles of the Arctic Circle.

An ability to predict areas of high vibrio abundance constitutes a vital public health tool that can be used to warn the public of infection risk. “The *Vibrio* Map Viewer uses environmental precursors of disease as an early warning system to protect public health,” says Jan Semenza, acting head of scientific assessment at the ECDC and lead author of the new study. “We were able to validate that the tool works nicely because the environmental and climatic signal did in fact translate into a true epidemiologic signal.” Using models based on the demonstrated relationship between rising SST and increasing infection risk, Semenza and his team forecast that Baltic coastal areas suitable for *Vibrio* growth will expand over the coming decades and that the season of warm coastal waters and increased risk will lengthen.³

The Baltic Sea region has been described as a “crucible of climate change,” notes Craig Baker-Austin, a microbiologist specializing in pathogenic vibrios at the Centre for Environment Fisheries and Aquaculture Science in Weymouth, UK. The sea is warming rapidly, and its coasts hold hot spots of human population density that may amplify disease risk.⁸ “Current rates of change coupled to



Most noncholera *Vibrio* infections come from eating raw shellfish, particularly oysters, or from swimming in contaminated waters. Image: © AlexeyKonovalenko/iStockphoto.

projection data suggest that vibriosis is likely to become an established public health issue [around the Baltic Sea],” says Baker-Austin, who was not involved in the new study. Both he and Semenza would like to see studies based on predictive tools such as the ECDC *Vibrio* Map Viewer performed worldwide to determine where vibriosis risks are likely to emerge in the future.

Vibrio infections aside from cholera are not reportable in most European countries, and the lack of epidemiologic data on vibriosis is a problem outside Sweden and Finland.³ Baker-Austin envisions a European system modeled on the Cholera and Other *Vibrio* Illness Surveillance (COVIS) system established by the U.S. Centers for Disease Control and Prevention. COVIS collects data on pathogenic *Vibrio* species, infection type and incidence, and geographic location of cases over time.⁹ “I strongly believe that we are missing a good number of infections,” Baker-Austin says. “Improving diagnostics, surveillance, and the network of epidemiology is the most effective way to improve the current situation.”

Noncholera *Vibrio* species cause small outbreaks or scattered cases of infection rather than widespread epidemics, but they can have a high case fatality rate, warns Semenza. That, he says, is why tracking the response of vibrios to warming seas is critical.

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